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The link between childhood trauma and dissociation in frequent users of classic psychedelics and dissociatives

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ABSTRACT

Background: Childhood trauma severity is associated with the level of subsequent substance use as well as with the self-reported severity of dissociation. Classic psychedelics and dissociatives target neurotransmitter systems thought to be involved in the onset of dissociative symptoms and may evoke severe and long-lasting symptoms of depersonalization in some users. However, it is currently unclear whether drug use puts people with a history of childhood trauma at higher risk of developing dissociative symptoms.

Objectives: The current study investigates whether the one-year prevalence of substance use significantly moderates the link between childhood trauma and the severity of depersonalization.

Methods: Participants ($n = 297$, of which 80.2% were active users) filled out an online self-report questionnaire including the Childhood Trauma Questionnaire (CTQ), the Cambridge Depersonalisation Scale (CDS), and information about their substance use.

Results: Results indicate that childhood trauma and substance use are significant individual predictors of dissociation scores in this sample, but no moderation of substance use on the link between childhood trauma and depersonalization was established.

Conclusions: It is hypothesized that the quality (particularly the context) of the experience of substance use rather than the sheer quantity may be responsible for the manifestation of depersonalization.

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Childhood trauma; substance use; dissociation; depersonalization; classic psychedelics; dissociatives

Introduction

It is well established that the severity of childhood trauma is associated both with levels of substance use and the severity of dissociation (Diseth, 2005; Najavits & Walsh, 2012; Najavits, Weiss, & Shaw, 1997). Three times higher rates of substance abuse in subjects with vs. without a history of childhood trauma have been reported in the general population (Kilpatrick, Saunders, & Smith, 2003), and the severity of childhood trauma is closely linked to the level of substance abuse (Khoury, Tang, Bradley, Cubells, & Ressler, 2010; Scheidell et al., 2018). In addition, subjects with childhood trauma were 1.5 times more likely to report illicit substance use within the past year (Widom, Marmorstein, & White, 2006). However, whether the level of substance use can partly explain the relationship between trauma severity and the severity of subsequent dissociation is currently unknown.

Link between childhood trauma, dissociation, and substance use



Dissociation is defined as a disruption of the normal integration of a person's conscious and psychological functions and as such can potentially disrupt every area of mental functioning (DSM-5). Most experiences of dissociation entail symptoms of depersonalization, which refers to self-related alterations including emotion processing, perception, and body experience. Dissociation in the

form of depersonalization correlates significantly with the levels of reported childhood trauma (Michal et al., 2007; Simeon, Guralnik, Schmeidler, Sirof, & Knutelska, 2001). However, the causal relationships underlying this association have been widely debated (see Dalenberg et al., 2012; Lynn et al., 2014). Some authors have suggested that additional moderators might have to be taken into account, suggesting a multifactorial model of dissociation (Lynn et al., 2014).

The link between childhood trauma, substance use, and dissociative experiences as well as high prevalence rates of comorbid substance use disorders in patients suffering from dissociative disorders (e.g., Dunn, Ryan, Paolo, & Van Fleet, 1995; Karadag et al., 2005) are well-established (Najavits & Walsh, 2012; Schäfer et al., 2010; Van Den Bosch, Verheul, Langeland, & Van Den Brink, 2003). While several psychoactive substances are known to have dissociative properties, others (like benzodiazepines or atypical antipsychotics) might specifically attract users suffering from dissociative experiences due to their anti-dissociative properties. Neurotransmitter systems that are thought to play a role in depersonalization include N-methyl-D-aspartate (NMDA), opium, and serotonin receptors (Simeon, 2004).

Classic psychedelics

Classic psychedelics or hallucinogens (including – among others – psilocybin, LSD, mescaline, and DMT or ayahuasca)

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are a class of psychoactive substances that trigger distinct forms of altered states of consciousness. They are characterized by their high affinity for serotonin receptors (Ray, 2010), but they also act on the glutamate and dopamine system (Vollenweider & Preller, 2016). Lifetime prevalence in the US of LSD, psilocybin, and mescaline use in people aged 21 to 64 was estimated to be 17% (Krebs & Johansen, 2013a). Classic psychedelics may induce a continuum of feelings ranging from happiness and oceanic boundlessness to anxiety, panic, paranoia, and psychosis (Nichols, 2016). They acutely alter visual perception and perception of time, self-experience, mood, thoughts, attention, working-memory, and suggestibility (Carhart-Harris et al., 2015; Hasler, Grimberg, Benz, Huber, & Vollenweider, 2004; Nichols, 2016; Studerus, Komater, Hasler, & Vollenweider, 2011). Even though population studies indicate that the recreational use of classic psychedelics is not associated with an increased risk for the emergence of psychiatric disorders (Hendricks, Thorne, Clark, Coombs, & Johnson, 2015; Johansen & Krebs, 2015), severe and long-lasting symptoms can be evoked in some users.

Dissociatives

The term “dissociatives” comprises substances which primarily act as NMDA receptor antagonists and may operate as agonists for various opium receptors. The most known dissociatives are Phencyclidine (PCP), Ketamine, and Dextromethorphan (DXM).

The effects of dissociatives often include sedation, distortion of perception, euphoria, confusion, cognitive impairment, and dissociative symptoms (Berman et al., 2000; Betzler & Majić, 2017; Murrough et al., 2013; Zarate et al., 2006). High doses may elicit strong symptoms of depersonalization including a complete loss of the self-experience, hallucinations, flashbacks, perceptual changes in all sensory modalities, and out-of-body experiences (Curran & Morgan, 2000; Jansen, 1989, 2011; Morgan & Curran, 2012; Morgan, Monaghan, & Curran, 2004; Muetzelfeldt et al., 2008).

In 2014, lifetime prevalence usage of PCP and Ketamine in US high-school seniors was around 2% (UNODC, 2014).

Substance use as a coping strategy to deal with trauma and dissociation?

Dissociative symptoms often start in adolescence, preceding the substance use in the majority of the cases (Karadag et al., 2005). Substance use typically commences in late adolescence or early adult life, at times as a form of self-medication to counteract trauma-related symptoms emerging from dysregulated biological stress responses (Najavits, 2002; Roesler & Dafler, 1993) whereby those with more severe symptoms of dissociation express stronger expectations to manage their symptoms using substances (Najavits & Walsh, 2012).

However, classic psychedelics and dissociatives target neurotransmitter systems thought to be implicated in the onset of dissociative symptoms such as glutamate NMDA receptor antagonists, serotonin receptor agonists, and opioid receptor agonists (see Simeon, 2004) and may evoke acute and in some users also long-term effects that resemble the qualitative experience of

depersonalization. Short-term dissociative effects of psychedelics have long been established (Denson, 1967; Kenna & Sedman, 1964) and are thought to closely resemble clinical effects of dissociation (Luckenbaugh et al., 2014; Morgan, Riccelli, Maitland, & Curran, 2004). However, illicit drug use (most commonly cannabis and hallucinogens) can also trigger chronic depersonalization (Simeon, Kozin, et al., 2009). It is currently unknown whether repetitive experiences (i.e., the quantity) of substance-induced depersonalization do more often cause severe or long-lasting depersonalization in subjects prone to dissociation due to their history of childhood trauma.

Goal for the current study

While it is known that the severity of childhood trauma is associated with the severity of subsequent dissociation, it is unclear whether the intervening usage of illicit drugs might partially explain this relationship, i.e., whether the severity of the experienced trauma predicts the severity of subsequent dissociative symptoms better when illicit drugs have amplified dissociative tendencies, i.e., when the diathesis induced by childhood trauma is actualized by the drug use.

The question thus arises whether the use of classic psychedelics and dissociatives might moderate the relationship between childhood trauma severity and the reported depersonalization levels, i.e., whether the positive relationship between childhood trauma and depersonalization is stronger for higher rates of substance use.

Method

Participants

Participants were recruited using social media pages and groups relevant to substance use and harm reduction content in order to include frequent users of specific classes of substances. Of 1007 participants who started filling out the questionnaire, $n = 703$ participants were excluded due to large amounts of missing data. Arbitrary responses were omitted, and subjects indicating a one-year prevalence of use of classic psychedelics and dissociatives on more than 100 occasions were checked individually leading to the exclusion of $n = 4$ cases. Furthermore, participants under the age of 16 ($n = 3$) were excluded from the analysis. After the exclusion procedure, $n = 297$ participants (44 (14.8%) women, 245 (82.5%) men, and 8 (2.7%) who identified as other sexes) ranging in ages from 16 to 63 ($M = 23.71$, $SD = 8.10$) were included in the analysis. Only $n = 61$ (12 women, 48 men, and 1 who identified as another sex) ranging in ages from 17 to 47 ($M = 22.08$; $SD = 6.51$) subsequently excluded subjects provided sociodemographic data, which indicated no significant differences in age ($t(356) = 1.48$, two-tailed $p = .14$) or sex ($\chi^2(2) = 1.08$, $p = .58$) between these dropouts and the participants.

Materials

Childhood trauma

For assessing childhood trauma, the 28-item self-report *Childhood Trauma Questionnaire* (CTQ; Bernstein & Fink, 1998; sample Cronbach $\alpha = .805$) was used. Participants had

to indicate on a 5-point Likert scale ranging from 1 “Never true” to 5 “Very often true” to what extent they agreed with statements concerning their childhood. Sub-scale sum scores for emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical abuse were computed and a total CTQ sum score was calculated by summing these.

Depersonalization severity

Symptom severity of depersonalization was assessed using the 29-item self-report *Cambridge Depersonalisation Scale* (CDS; Sierra & Berrios, 2000; sample Cronbach $\alpha = .965$). Participants rated the frequency and duration of dissociative experiences on a 5-point Likert scale ranging from 0 “Never” to 4 “All the time” and on a 6-points Likert scale ranging from 1 “Few seconds” to 6 “More than a week”, respectively. An additional question regarding the age of onset of dissociative symptoms was included. Frequency and duration items for the CDS were added up separately in order to arrive at discrete sum scores for frequency and duration. For the overall CDS sum score used in the model, all frequency and duration items were summed up.

Substance use

Demographic data (i.e., age, sex) and patterns of substance use were measured by a shortened and adapted version of a questionnaire constructed and utilized by the *European School Survey Project on Alcohol and Other Drugs* (ESPAD). Questions regarding prevalence of alcohol use, tobacco use, and cannabis use were answered in an open format, while questions concerning the lifetime and yearly prevalence of the use of classic psychedelics, dissociatives, and other psychoactive substances were answered on a scale ranging from 0 to 1000. Further, questions about the prevalence of the use of classic psychedelics and dissociatives during the last 30 days were answered on a scale ranging from 0 to 100. We further followed the approach by Morris and Wallach (2014) and focused on uncompetitive NMDA-receptor antagonists and their analogues and thus excluded selective kappa opioid receptor (KOR) agonists like Salvinorin A, as it may not be regarded as dissociative in the narrow sense due to its specific psychoactive and pharmacodynamic features (see Betzler and Majić, 2017; Johnson, MacLean, Reissig, Prisinzano, & Griffiths, 2011). Mixed NMDA-receptor antagonist/KOR agonists and classic psychedelics with minor epidemiological relevance (see Sumnall, 2018) were excluded as well. The questions assessing the age of first-time substance listed ages 9 to 25 as well as the option “older than 25”.

One-year prevalence of classic psychedelics was computed by adding up the number of occasions Ayahuasca, LSD, mescaline, DMT, and psilocybin were used in the past year. One-year prevalence for dissociatives was calculated by adding up the number of occasions Ketamine, PCP, DXM, 2-Fluorodeschloroketamine, Eticyclidone, 3-Methoxyeticyclidine, 3-, 4-Methoxyphencyclidine, Deschloroketamine, Ephedrine, Methoxetamine, and Methoxphenidine were used in the past year, and the three items indicating consumption of additional dissociative substances. Eventually, the one-year

prevalence of use of both substances was calculated by adding up their sum scores of one-year prevalences.

Procedure

Ethics for the study was granted by the Ethical Committee of Psychology of the University of Groningen in December 2017. Data collection took place between December 2017 and February 2018. Harm reduction and substance information centers, associations, and websites like *PsychonautWiki* (psychonautwiki.org), *Eve&Rave* (eve-rave.ch), *Chill out e. V.*, and *MIND European Foundation for Psychedelic Science* (MIND Foundation) supported the distribution of the link to the online questionnaire on *Qualtrics* through various channels. The survey was estimated to take 20 min to be filled out. Participation was voluntary and anonymous; participants were given one week to complete the questionnaires and it was made clear to them that they may withdraw their cooperation at any time. Due to the nature of some questions, they were further informed about the possibility of experiencing distress. International websites with trauma-related information were therefore provided in the debriefing. They were not offered any compensation for their participation and provided written informed consent before study participation.

Data analysis

The data were analyzed using SPSS version 25. Only complete data sets were considered for the analysis. As stated in the pre-registration (https://aspredicted.org/see_one.php?a_id=7496), scores on the extreme ends of the scales for trauma exposure and dissociation severity, i.e., potential outliers, were not excluded as they might indeed be valid cases.

The criterion and the predictor variables were standardized (Aiken, West, & Reno, 1991) following graphical inspection of the residuals. A multiple regression analysis (Baron & Kenny, 1986) with one-year prevalence of substance use and childhood trauma severity as predictors was computed. Moderation was tested by regressing the dependent variable CDS on childhood trauma severity and on one-year prevalence of substance use as well as the interaction of the two. Ad hoc, explorative analyses were run by including lifetime prevalence and one-month prevalence of use separately as predictors into the model. The sum scores of use of classic psychedelics and dissociatives were also separately included into the analysis. The statistical threshold for significance testing was set to $p \leq .05$ (two-sided).

Results

In the sample, 72.7% of participants used classic psychedelics at least once during the past year, mostly LSD (58.9%) and psilocybin (44.4%; see Table 1 for details). In addition, 45.8% of the participants consumed dissociatives at least once during the past year (mostly Ketamine (22.2%) and DXM (20.2%)). Overall, 80.2% of participants used either classic psychedelics or dissociatives during the past year. On average, participants reported using these substances 20.46 times during the last year ($SD = 51.42$, Range = 0 to 506).

Table 1. Pattern of one-year prevalence of substance use (N = 297).

	AYA ^a	LSD ^b	MES ^c	DMT ^b	PSI ^e	KET ^f	PCP ^g	DXM ^h	2-FDCK ⁱ	O-PCE ^j	3-MeO-PCE ^k	3-MeO-PCP ^l	4-MeO-PCP ^m	DXE ⁿ	EPE ^o	MXE ^p	MXP ^q	D*	CP**	CP&D
Mean	.29	4.72	.18	1.17	2.52	2.48	.35	3.29	.10	.33	.62	.84	.00	.40	.20	.04	.55	11.58	8.88	20.46
Median	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	7
SD	1.80	10.08	1.04	5.11	7.75	15.89	5.81	30.05	.97	4.13	8.25	6.81	.06	2.53	1.77	.33	8.71	47.36	17.92	51.42
Min.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Max.	24	95	15	60	92	257	100	504	15	70	140	100	1	30	21	4	150	506	187	506

* Dissociatives

** Classic Psychedelics

^a Ayahuasca^b Lysergic acid diethylamide^c Mescaline^d N,N-Dimethyltryptamine^e Psilocybin^f Ketamine^g Phencyclidine^h Dextromethorphanⁱ 2-Fluorodeschloroketamine^j Eticyclidone^k 3-Methoxyeticyclidone^l 3-Methoxyphencyclidine^m 4-Methoxyphencyclidineⁿ Deschloroketamine^o Ephedrine^p Methoxetamine^q Methoxphenidine

Table 2. Regression of depersonalization severity as measured with the Cambridge Depersonalisation Scale on sex, age, childhood trauma severity as measured with the Childhood Trauma Questionnaire (CTQ) and substance use (N = 297).

Model	B	Std. Error	Beta	t	Sig. (p)
1 (Constant)	.135	.083		1.625	.105
Sex	-.026	.142	-.010	-.183	.855
Age	-.223	.054	-.219	-4.108	<.001
CTQ	.400	.056	.388	7.189	<.001
Substance Use	1.389	.683	.108	2.035	.043
2 (Constant)	.174	.090		1.941	.053
Sex	-.038	.143	-.014	-.269	.788
Age	-.226	.054	-.222	-4.164	<.001
CTQ	.382	.058	.370	6.595	<.001
Substance Use	1.759	.754	.137	2.331	.020
Substance Use x CTQ	-.383	.334	-.068	-1.148	.252

The sample was characterized by elevated levels of depersonalization (CDS, $M = 51.11$; $SD = 43.45$) and childhood trauma (CTQ, $M = 43.44$; $SD = 13.66$) which is discussed below.

All three variables correlated significantly with each other, with CTQ scores and CDS scores showing the highest correlation ($r = .37$, $p < .001$), while substance use frequency correlated with $r = .15$ ($p = .005$) with CTQ scores and with $r = .18$ ($p = .001$) with CDS.

In the regression analysis, CDS scores were significantly predicted (R Square = .200; $F(1, 291) = 18.31$; $p < .001$) through CTQ (Beta = .388), substance use (Beta = .108) scores as well as age (Beta = -.219), while sex was not a significant predictor (see Table 2). However, inclusion of the interaction term did not result in a significant increase (R Square = .204; $F(1, 291) = 1.32$, $p = .25$), i.e., indicating that there was no moderation effect.

Subsequently, the analysis was repeated using lifetime prevalence and one-month prevalence of use of classic psychedelics and dissociatives as moderator variables. No significant interaction terms were found there, either (lifetime prevalence $F(1, 291) = 0.27$, $p = .60$; one-month prevalence $F(1, 291) = 2.37$, $p = .13$).

To test for differential associations of the two substance classes, one-year prevalence of classic psychedelics ($t = 1.77$, $p = .08$) and dissociatives ($t = 1.52$, $p = .13$) were taken into account separately. Again, no significant interactions were found for either class of substances (classic psychedelics $F(1, 291) = 1.85$, $p = .18$; dissociatives $F(1, 291) = 1.66$, $p = .20$). When regressing CDS frequency- and duration scores separately on CTQ and on one-year prevalence of substance use and the interaction of the two, no significant interaction effect was found in either model (frequency $F(1, 291) = 0.63$, $p = .43$; duration $F(1, 293) = 1.83$, $p = .18$).

Discussion

The current study reconfirmed that dissociation severity in the form of depersonalization is predicted by both the severity of childhood trauma and the usage of illicit substances (i.e., classic psychedelics and dissociatives) over the last year. However, the data indicate that the link between traumatic childhood experiences and dissociative phenomena is not moderated by the quantity of classic psychedelics and

dissociatives used by the participants. The association between the severity of childhood trauma and depersonalization is thus not contingent upon drug usage, as a diathesis-stress model might have predicted.

In addition, childhood trauma explained much more variance in dissociation severity (13.8%) than substance use (1.2%). And while age explained an additional 5% of variance, the lion share of the variance was not attributable to one of the tested predictors. When classic psychedelics and dissociatives were separately included into the model, both were rendered non-significant suggesting that cumulative effects of several substances (i.e., polydrug use) may play a role in depersonalization – or that common underlying factors in polydrug use (e.g., individual (epi)genetics or sensation-seeking) may have to be investigated further.

Sample characteristics

Average childhood trauma severity in the current sample was comparable to those reported in subjects with an alcohol addiction (Schäfer et al., 2010), but higher than in subjects without any psychiatric diagnoses (Simeon, Giesbrecht, et al. 2009). Additionally, participants in the present sample scored well below the determined threshold for clinical levels of depersonalization (Sierra & Berrios, 2000) and lower than a sample of DPD patients (Simeon, Giesbrecht et al. 2009), but exhibited higher CDS scores than subjects diagnosed with PTSD and healthy controls (Simeon, Giesbrecht et al. 2009). That the current sample reported higher depersonalization values than PTSD patients on average is somewhat surprising and might be due to the fact that their substance use by far exceeds levels represented in the general population (see, e.g., Pfeiffer-Gerschel, Jakob, & Stumpf, 2014; UNODC, 2014).

Limitations and recommendations for future studies

The generalizability of the results is limited by potential biases of convenience samples (see Bornstein, Jager, & Putnick, 2013). As a result, subjects with limited access to the internet, limited power of concentration, or those severely impaired due to clinical psychopathology may be underrepresented in the study. As high-frequency substance users were targeted, reported rates of substance use may exceed the average usage in traumatized people and thus should not be generalized to all traumatized populations. Women are underrepresented in this study as compared to the general population, which is due to the fact that users of substance use and harm-reduction websites are known to be predominantly males in their twenties with high consumption rates of illicit substances (Baggott, Erowid, Erowid, Galloway, & Mendelson, 2010; Chiauzzi, Dasmahapatra, Lobo, & Barratt, 2013; Orsolini, Papanti, Francesconi, & Schifano, 2015; Temple & Brown, 2011). Future studies should, therefore, test specifically whether the experience of depersonalization is differentially influenced by substance use in women.

We did not collect data on the use of selective KOR agonists and mixed NMDA-receptor antagonist/KOR agonists. As these substances exhibit dissociative properties but were not included in the current study, their association with

childhood trauma could not be tested. Future studies should aim to recruit a sample large enough to warrant such an analysis.

The current study only tested the influence of the amount of drug use, not taking the quality of the experience (Roseman, Nutt, & Carhart-Harris, 2018) and context of usage (Carhart-Harris et al., 2018) into account. It is conceivable that the context substances are used in may influence the outcome resulting in certain people experiencing depersonalization after using aforementioned substances on a single occasion whereas other people may use them multiple times without negative ramifications (see Krebs & Johansen, 2013b; Simeon, Kozin, et al. 2009). In addition, the reported depersonalization could also have been the result of withdrawal from other substances (Djenderedjian & Tashjian, 1982; Shufman, Lerner, & Witztum, 2005) and pharmaceuticals (Ashton, 1991; Marriott & Tyrer, 1993; Mourad, Lejoyeux, & Adès, 1998; Terao, Yoshimura, Terao, & Abe, 1992).

Additional factors potentially influencing the relationship between retrospectively reported childhood trauma and depersonalization severity, such as level of education (Michal et al., 2015), polydrug use, prescription medications (Ashton, 1991; Marriott & Tyrer, 1993; Mourad et al., 1998; Terao et al., 1992), suggestibility (Giesbrecht, Lynn, Lilienfeld, & Merckelbach, 2008), and specific psychiatric diagnoses (Baker et al., 2003; Simeon, Knutelska, Nelson, & Guralnik, 2003) might have influenced the results and should be controlled for in future studies.

Finally, it has to be stressed that the findings are merely based on cross-sectional correlations and cannot conclusively demonstrate whether the reported trauma experiences and substance use preceded depersonalization (see Aldrich, 1995).

Conclusion and outlook

Childhood trauma and substance use were established as significant independent predictors of depersonalization scores. However, results did not indicate a moderation effect for substance use on the link between childhood trauma and depersonalization. The results of the present study are important in that they replicate past findings regarding traumatic childhood experiences and their positive association with facets of dissociation (e.g., Diseth, 2005; Simeon et al., 2001). These findings should be used in substance use prevention. However, more research regarding the quality of the experience as well as other possible moderator variables are needed in order to shed light on how traumatic childhood experiences translate to depersonalization.

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Disclosure of potential conflicts of interest

All authors declare that they have no conflict of interest.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to their containing information that could compromise the privacy of research participants.

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References

- Aiken, L. S., West, S. G., & Reno, R. R. (1991). *Multiple regression : Testing and interpreting interactions*. Sage Publications. Retrieved from https://books.google.nl/books/about/Multiple_Regression.html?id=LcWLUyXcmnkC&redir_esc=y
- Aldrich, J. (1995). Correlations Genuine and Spurious in Pearson and Yule. *Statistical Science*, 10(4), 364–376. doi:10.1214/ss/1177009870
- Ashton, H. (1991). Protracted withdrawal syndromes from benzodiazepines. *Journal of Substance Abuse Treatment*, 8(1–2), 19–28. doi:10.1016/0740-5472(91)90023-4
- Baggott, M. J., Erowid, E., Erowid, F., Galloway, G. P., & Mendelson, J. (2010). Use patterns and self-reported effects of *Salvia divinorum*: An internet-based survey. *Drug and Alcohol Dependence*, 111(3), 250–256. doi:10.1016/j.drugalcdep.2010.05.003
- Baker, D., Hunter, E., Lawrence, E., Medford, N., Patel, M., Senior, C., ... David, A. S. (2003). Depersonalisation disorder: Clinical features of 204 cases. *The British Journal of Psychiatry : the Journal of Mental Science*, 182, 428–433. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/12724246>
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social the moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173–1182. doi:10.1037/0022-3514.51.6.1173
- Berman, R. M., Cappiello, A., Anand, A., Oren, D. A., Heninger, G. R., Charney, D. S., & Krystal, J. H. (2000). Antidepressant effects of ketamine in depressed patients. *Biological Psychiatry*, 47(4), 351–354. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/10686270>
- Bernstein, D., & Fink, L. (1998). Childhood trauma questionnaire: A retrospective self-report: Manual. Retrieved from <https://scholar.google.nl/scholar?hl=de&sdt=0%2C5&q=Bernstein%2C+D.P%2C+%26+Fink%2C+L.+&btnG=Childhood+Trauma+Questionnaire%3A+A+retrospective+self-report+manual+San+Antonio%2C+TX%3A+The+Psychological+Corporation.&btnG=>
- Betzler, F., & Majić, T. (2017). Dissoziativa. In M. von Heyden, H. Jungaberle, & T. Majić (Eds.), *Handbuch Psychoaktive Substanzen* (pp. 683–699). Berlin, Heidelberg: Springer Reference Psychologie. doi:10.1007/978-3-642-55214-4
- Bornstein, M. H., Jager, J., & Putnick, D. L. (2013). Sampling in developmental science: Situations, shortcomings, solutions, and standards. *Developmental Review*, 33, 357–370. doi:10.1016/j.dr.2013.08.003
- Carhart-Harris, R. L., Kaelen, M., Whalley, M. G., Bolstridge, M., Feilding, A., & Nutt, D. J. (2015). LSD enhances suggestibility in healthy volunteers. *Psychopharmacology*, 232(4), 785–794. doi:10.1007/s00213-014-3714-z
- Carhart-Harris, R. L., Roseman, L., Haijen, E., Erritzoe, D., Watts, R., Branchi, I., & Kaelen, M. (2018). Psychedelics and the essential importance of context. *Journal of Psychopharmacology*, 026988111875471. doi:10.1177/0269881118754710
- Chiauzzi, E., Dasmahapatra, P., Lobo, K., & Barratt, M. J. (2013). Participatory research with an online drug forum: A survey of user characteristics,

- information sharing, and harm reduction views. *Substance Use & Misuse*, 48(8), 661–670. doi:10.3109/10826084.2013.800117
- Curran, H. V., & Morgan, C. (2000). Cognitive, dissociative and psychotogenic effects of ketamine in recreational users on the night of drug use and 3 days later. *Addiction (Abingdon, England)*, 95(4), 575–590. doi:10.1046/j.1360-0443.2000.9545759.x
- Dalenberg, C. J., Brand, B. L., Gleaves, D. H., Dorahy, M. J., Loewenstein, R. J., Cardeña, E., ... Spiegel, D. (2012). Evaluation of the evidence for the trauma and fantasy models of dissociation. *Psychological Bulletin*, 138(3), 550–588. doi:10.1037/a0027447
- Denson, R. (1967). Dissociative Delirium After Treatment with Lysergide. *Canadian Medical Association Journal*, 97(20), 1222–1224.
- Diseth, T. H. (2005). Dissociation in children and adolescents as reaction to trauma - An overview of conceptual issues and neurobiological factors. *Nordic Journal of Psychiatry*, 59(2), 79–91. doi:10.1080/08039480510022963
- Djenderedjian, A., & Tashjian, R. (1982). Agoraphobia following amphetamine withdrawal. *The Journal of Clinical Psychiatry*, 43(6), 248–249. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/7085580>
- Dunn, G. E., Ryan, J. J., Paolo, A. M., & Van Fleet, J. N. (1995). Comorbidity of dissociative disorders among patients with substance use disorders. *Psychiatric Services*, 46(2), 153–156. Retrieved from <http://www.embase.com/search/results?subaction=viewrecord%7B%7Dfrom=export%7B%7Ddid=L25081970%5Cnhttp://bb2sz3ek3z.search.serialsolutions.com?sid=EMBASE%7B%7Ddissn=10752730%7B%7Ddid=doi:%7B%7Dtitle=Comorbidity+of+dissociative+disorders+among+patients+>
- Giesbrecht, T., Lynn, S. J., Lilienfeld, S. O., & Merckelbach, H. (2008). Cognitive processes in dissociation: An analysis of core theoretical assumptions. *Psychological Bulletin*, 134(5), 617–647. doi:10.1037/0033-2909.134.5.617
- Hasler, F., Grimberg, U., Benz, M. A., Huber, T., & Vollenweider, F. X. (2004). Acute psychological and physiological effects of psilocybin in healthy humans: A double-blind, placebo-controlled dose-effect study. *Psychopharmacology*, 172(2), 145–156. doi:10.1007/s00213-003-1640-6
- Hendricks, P. S., Thorne, C. B., Clark, C. B., Coombs, D. W., & Johnson, M. W. (2015). Classic psychedelic use is associated with reduced psychological distress and suicidality in the United States adult population. *Journal of Psychopharmacology*, 29(3), 280–288. doi:10.1177/0269881114565653
- Jansen, K. (1989). Near death experience and the NMDA receptor. *Bmj*, 298(6689), 1708. doi:10.1136/bmj.298.6689.1708-b
- Jansen, K. L. R. (2011). *Ketamine: Dreams and Realities*. MAPS (Vol. 31). Sarasota, FL: MAPS. doi:10.2307/374065
- Johansen, P.-Ø., & Krebs, T. S. (2015). Psychedelics not linked to mental health problems or suicidal behavior: A population study. *Journal of Psychopharmacology*, 29(3), 270–279. doi:10.1177/0269881114568039
- Johnson, M. W., MacLean, K. A., Reissig, C. J., Prisinzano, T. E., & Griffiths, R. R. (2011). Human psychopharmacology and dose-effects of salvinorin A, a kappa opioid agonist hallucinogen present in the plant *Salvia divinorum*. *Drug and Alcohol Dependence*, 115(1–2), 150–155. doi:10.1016/j.drugalcdep.2010.11.005
- Karadag, F., Sar, V., Tamar-Gurol, D., Evren, C., Karagoz, M., & Erkiran, M. (2005). Dissociative disorders among inpatients with drug or alcohol dependency. *Journal of Clinical Psychiatry*, 66(10), 1247–1253. doi:10.4088/JCP.v66n1007
- Kenna, J. C., & Sedman, G. (1964). The Subjective Experience of Time During Lysergic Acid Diethylamide (LSD-25) Intoxication. *Psychopharmacologia*, 5, 280–288. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/14143340>
- Khoury, L., Tang, Y. L., Bradley, B., Cubells, J. F., & Ressler, K. J. (2010). Substance use, childhood traumatic experience, and Posttraumatic Stress Disorder in an urban civilian population. *Depression and Anxiety*, 27(12), 1077–1086. doi:10.1002/da.20751
- Kilpatrick, D. G., Saunders, B. E., & Smith, D. W. (2003, April 19). Youth Victimization: Prevalence and Implications. *Youth Victimization*. Retrieved from www.ncjrs.gov/pdffiles1/nij/194972.pdf
- Krebs, T. S., & Johansen, P.-Ø. (2013a). Over 30 million psychedelic users in the United States. *F1000Research*, 98(185924), 1–5. doi:10.12688/f1000research.2-98.v1
- Krebs, T. S., & Johansen, P.-Ø. (2013b). Psychedelics and mental health: A population study. *PloS one*, 8(8), e63972. doi:10.1371/journal.pone.0063972
- Luckenbaugh, D. A., Niciu, M. J., Ionescu, D. F., Nolan, N. M., Richards, E. M., Brutsche, N. E., ... Zarate, C. A. (2014). Do the dissociative side effects of ketamine mediate its antidepressant effects? *Journal of Affective Disorders*, 159, 56–61. doi:10.1016/j.jad.2014.02.017
- Lynn, S. J., Lilienfeld, S. O., Merckelbach, H., Giesbrecht, T., McNally, R. J., Loftus, E. F., ... Malaktaris, A. (2014). The trauma model of dissociation: Inconvenient truths and stubborn fictions. Comment on Dalenberg et al. (2012). *Psychological Bulletin*, 140(3), 896–910. doi:10.1037/a0035570
- Marriott, S., & Tyrer, P. (1993). Benzodiazepine dependence. Avoidance and withdrawal. *Drug Safety*, 9(2), 93–103. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/8104417>
- Michal, M., Beutel, M. E., Jordan, J., Zimmermann, M., Wolters, S., & Heidenreich, T. (2007). Depersonalization, mindfulness, and childhood trauma. *Journal of Nervous and Mental Disease*, 195(8), 693–696. doi:10.1097/NMD.0b013e3181ff4492
- Michal, M., Duven, E., Giral, S., Dreier, M., Müller, K. W., Adler, J., ... Wölfling, K. (2015). Prevalence and correlates of depersonalization in students aged 12–18 years in Germany. *Social Psychiatry and Psychiatric Epidemiology*, 50(6), 995–1003. doi:10.1007/s00127-014-0957-2
- Morgan, C. J. A., & Curran, H. V. (2012). Ketamine use: A review. *Addiction*, 107(1), 27–38. doi:10.1111/j.1360-0443.2011.03576.x
- Morgan, C. J. A., Monaghan, L., & Curran, H. V. (2004). Beyond the K-hole: A 3-year longitudinal investigation of the cognitive and subjective effects of ketamine in recreational users who have substantially reduced their use of the drug. *Addiction*, 99(11), 1450–1461. doi:10.1111/j.1360-0443.2004.00879.x
- Morgan, C. J. A., Riccelli, M., Maitland, C. H., & Curran, H. V. (2004). Long-term effects of ketamine: Evidence for a persisting impairment of source memory in recreational users. *Drug and Alcohol Dependence*, 75(3), 301–308. doi:10.1016/j.drugalcdep.2004.03.006
- Morris, H., & Wallach, J. (2014). From PCP to MXE: A comprehensive review of the non-medical use of dissociative drugs. *Drug Testing and Analysis*, 6(7–8), 614–632. doi:10.1002/dta.1620
- Mourad, I., Lejoyeux, M., & Adès, J. (1998). Prospective evaluation of antidepressant discontinuation. *L'Encephale*, 24(3), 215–222. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/9696914>
- Muetzelfeldt, L., Kamboj, S. K., Rees, H., Taylor, J., Morgan, C. J. A., & Curran, H. V. (2008). Journey through the K-hole: Phenomenological aspects of ketamine use. *Drug and Alcohol Dependence*, 95(3), 219–229. doi:10.1016/j.drugalcdep.2008.01.024
- Murrough, J. W., Iosifescu, D. V., Chang, L. C., Al Jurdi, R. K., Green, C. E., Perez, A. M., ... Mathew, S. J. (2013). Antidepressant efficacy of ketamine in treatment-resistant major depression: A two-site randomized controlled trial. *American Journal of Psychiatry*, 170(10), 1134–1142. doi:10.1176/appi.ajp.2013.13030392
- Najavits, L. (2002). *Seeking safety : A treatment manual for PTSD and substance abuse*. New York: Guilford Press.
- Najavits, L. M., & Walsh, M. (2012). Dissociation, PTSD, and Substance Abuse: An Empirical Study. *Journal of Trauma and Dissociation*, 13(1), 115–126. doi:10.1080/15299732.2011.608781
- Najavits, L. M., Weiss, R. D., & Shaw, S. R. (1997). The link between substance abuse and posttraumatic stress disorder in women: A research review. *The American Journal on Addictions*, 6(4), 273–283. doi:10.3109/10550499709005058
- Nichols, D. E. (2016, April). Psychedelics. *Pharmacological Reviews*, 68(2), 264–355.
- Orsolini, L., Papanti, G. D., Francesconi, G., & Schifano, F. (2015). Mind navigators of chemicals' experimenters? A web-based description of e-psychonauts. *Cyberpsychology, Behavior and Social Networking*, 18(5), 296–300. doi:10.1089/cyber.2014.0486
- Pfeiffer-Gerschel, T., Jakob, L., & Stumpf, D. (2014). Bundeszentrale für gesundheitliche Aufklärung (BZgA) (Prävention) Deutsche Hauptstelle für Suchtfragen (DHS) (Behandlung). Retrieved from http://www.dhs.de/fileadmin/user_upload/pdf/EBDD_Jahresberichte/REITOX_Report_2014_Germany_DE.pdf

- Ray, T. S. (2010). Psychedelics and the human receptorome. *PloS one*, 5, 2. doi:10.1371/journal.pone.0009019
- Roesler, T. A., & Dafler, C. E. (1993). Chemical dissociation in adults sexually victimized as children: Alcohol and drug use in adult survivors. *Journal of Substance Abuse Treatment*, 10(6), 537–543. doi:10.1016/0740-5472(93)90057-9
- Roseman, L., Nutt, D. J., & Carhart-Harris, R. L. (2018). Quality of Acute Psychedelic Experience Predicts Therapeutic Efficacy of Psilocybin for Treatment-Resistant Depression. *Frontiers in Pharmacology*, 8, 974. doi: 10.3389/fphar.2017.00974
- Schäfer, I., Langeland, W., Hissbach, J., Luedecke, C., Ohlmeier, M. D., & Chodzinski, C.; TRAUMAB-Study group. (2010). Childhood trauma and dissociation in patients with alcohol dependence, drug dependence, or both—A multi-center study. *Drug and Alcohol Dependence*, 109(1–3), 84–89.
- Scheidell, J. D., Quinn, K., McGorray, S. P., Frueh, B. C., Beharie, N. N., Cottler, L. B., & Khan, M. R. (2018). Childhood traumatic experiences and the association with marijuana and cocaine use in adolescence through adulthood. *Addiction*, 113(1), 44–56. doi:10.1111/add.13921
- Shufman, E., Lerner, A., & Witztum, E. (2005). [Depersonalization after withdrawal from cannabis usage]. *Harefuah*, 144(4), 249–251, 303. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/15889607>
- Sierra, M., & Berrios, G. E. (2000). The Cambridge Depersonalisation Scale: A new instrument for the measurement of depersonalisation. *Psychiatry Research*, 93(2), 153–164. doi:10.1016/S0165-1781(00)00100-1
- Simeon, D. (2004). Depersonalisation disorder: A contemporary overview. *CNS Drugs*, 18(6), 343–354. doi:10.2165/00023210-200418060-00002
- Simeon, D., Giesbrecht, T., Knutelska, M., Smith, R. J., & Smith, L. M. (2009). Alexithymia, Absorption, and Cognitive Failures in Depersonalization Disorder. *The Journal of Nervous and Mental Disease*, 197(7), 492–498. doi:10.1097/NMD.0b013e3181aaef6b
- Simeon, D., Guralnik, O., Schmeidler, J., Sirof, B., & Knutelska, M. (2001). The role of childhood interpersonal trauma in depersonalisation disorder. *The American Journal of Psychiatry*. *American Journal of Psychiatry*, 158(9), 1027–1033. doi:10.1176/appi.ajp.158.7.1027
- Simeon, D., Knutelska, M., Nelson, D., & Guralnik, O. (2003). Feeling unreal: A depersonalization disorder update of 117 cases. *The Journal of Clinical Psychiatry*, 64(9), 990–997. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/14628973>
- Simeon, D., Kozin, D. S., Segal, K., & Brenna, L. (2009). Is depersonalization disorder initiated by illicit drug use any different? A survey of 394 adults. *Journal of Clinical Psychiatry*, 70(10), 1358–1364. doi:10.4088/JCP.08m04370
- Studerus, E., Kommer, M., Hasler, F., & Vollenweider, F. X. (2011). Acute, subacute and long-term subjective effects of psilocybin in healthy humans: A pooled analysis of experimental studies. *Journal of Psychopharmacology*, 25(11), 1434–1452. doi:10.1177/0269881110382466
- Sumnall, H. (2018). Epidemiologie des Konsums von neuen psychoaktiven Substanzen. In H. Jungaberle, & T. Majić (Eds.), *Handbuch Psychoaktive Substanzen* (pp. 263–278). Berlin, Heidelberg: Springer Reference Psychologie. doi:10.1007/978-3-642-55125-3_94
- Temple, E. C., & Brown, R. F. (2011). A comparison of internet-based participant recruitment methods: Engaging the hidden population of cannabis users in research. Retrieved from <http://jrp.icaap.org/index.php/jrp/article/view/288/247>
- Terao, T., Yoshimura, R., Terao, M., & Abe, K. (1992). Depersonalization following nitrazepam withdrawal. *Biological Psychiatry*, 31(2), 212–213. doi:10.1016/0006-3223(92)90209-1
- UNODC. (2014). *2014 Global Synthetic Drugs Assessment (Sales No.)*. Vienna: United Nations Publication.
- Van Den Bosch, L. M. C., Verheul, R., Langeland, W., & Van Den Brink, W. (2003). Trauma, Dissociation, and Posttraumatic Stress Disorder in Female Borderline Patients With and Without Substance Abuse Problems. *Australian & New Zealand Journal of Psychiatry*, 37(5), 549–555. doi:10.1046/j.1440-1614.2003.01199.x
- Vollenweider, F. X., & Preller, K. H. (2016). Neurobiologische Grundlagen der Wirkung von Psychedelika. In M. von Heyden, H. Jungaberle, & T. Majić (Eds.), *Handbuch Psychoaktive Substanzen* (pp. 423–436). Berlin, Heidelberg: Springer Reference Psychologie.
- Widom, S. C., Marmorstein, N. R., & White, R. H. (2006). Childhood victimization and illicit drug use in middle adulthood. *Psychology of Addictive Behaviors*, 20(4), 394–403. doi:10.1037/0893-164X.20.4.394
- Zarate, C. A., Singh, J. B., Carlson, P. J., Brutsche, N. E., Ameli, R., Luckenbaugh, D. A., ... Manji, H. K. (2006). A Randomized Trial of an N-methyl-D-aspartate Antagonist in Treatment-Resistant Major Depression. *Archives of General Psychiatry*, 63(8), 856. doi:10.1001/archpsyc.63.8.856